SOUTH CAROLINA INFRASTRUCTURE STUDY

— REPORT 2B —

COSTS OF SPRAWL SAVINGS RELATED TO TECHNOLOGY REDUCING INFRASTRUCTURE NEEDS AND COSTS

STATE OF SOUTH CAROLINA
STATE BUDGET AND CONTROL BOARD
ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS

CENTER FOR URBAN POLICY RESEARCH (CUPR)
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
CIVIC SQUARE • 33 LIVINGSTON AVENUE • SUITE 400
NEW BRUNSWICK, NEW JERSEY 08901-1982
(908) 932-3133, EXT. 542

Robert W. Burchell
Alex Zakrewsky

WILBUR SMITH ASSOCIATES
1301 GERVAIS STREET, SUITE 1300
COLUMBIA, SOUTH CAROLINA 29201
(803) 758-4500

Robert J. Zuelsdorf
Arno Hart

SIEMON, LARSEN & MARSH
433 PLAZA REAL, SUITE 339
BOCA RATON, FLORIDA 33432
(407) 368-3808

Charles L. Siemon
Wendy U. Larsen

SANDSTONE ENVIRONMENTAL ASSOCIATES, INC.
15 CLYDE ROAD, SUITE 202
SOMERSET, NEW JERSEY 08873
(908) 873-3732

Nancy C. Neuman

21 JANUARY 1997

DRAFT: NOT FOR QUOTATION OR ATTRIBUTION

SOUTH CAROLINA INFRASTRUCTURE STUDY

— REPORT 2B —

COSTS OF SPRAWL SAVINGS RELATED TO TECHNOLOGY REDUCING INFRASTRUCTURE NEEDS AND COSTS

STATE OF SOUTH CAROLINA
STATE BUDGET AND CONTROL BOARD
ADVISORY COMMISSION ON INTERGOVERNMENTAL RELATIONS

CENTER FOR URBAN POLICY RESEARCH (CUPR)
RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY
CIVIC SQUARE • 33 LIVINGSTON AVENUE • SUITE 400
NEW BRUNSWICK, NEW JERSEY 08901-1982
(908) 932-3133, EXT. 542

Robert W. Burchell
Alex Zakrewsky

WILBUR SMITH ASSOCIATES
1301 GERVAIS STREET, SUITE 1300
COLUMBIA, SOUTH CAROLINA 29201
(803) 758-4500

Robert J. Zuelsdorf
Arno Hart

SIEMON, LARSEN & MARSH
433 PLAZA REAL, SUITE 339
BOCA RATON, FLORIDA 33432
(407) 368-3808

Charles L. Siemon
Wendy U. Larsen

SANDSTONE ENVIRONMENTAL ASSOCIATES, INC.
15 CLYDE ROAD, SUITE 202
SOMERSET, NEW JERSEY 08873
(908) 873-3732

Nancy C. Neuman

21 JANUARY 1997

TABLE OF CONTENTS

PART I—BACKGROUND TO COSTS OF SPRAWL 1

INTRODUCTION 2
BACKGROUND 2
CHARACTERISTICS OF SPRAWL AND COMPACT GROWTH 3
COMPACT GROWTH AND ITS RESOURCE SAVINGS 5
Capital Public Infrastructure Costs 5
Capital Private Housing Costs 6
Land Consumption Costs 7
Fiscal Impacts 8
Summary of Development Pattern Impacts 10
Applying the Results of Savings to South Carolina Infrastructure Savings 10
THE QUID PRO QUO FOR COSTS OF SPRAWL SAVINGS 12
THE IMPORTANCE OF GROWTH MANAGEMENT 12
A DEMONSTRATION PROGRAM FOR GROWTH MANAGEMENT 12
CONCLUSION 13
REFERENCES AND SELECTED BIBLIOGRAPHY 14

PART II—STATEWIDE COSTS OF SPRAWL SAVINGS 18

Statewide Costs of Sprawl Savings 19

PART III—REGIONAL COSTS OF SPRAWL SAVINGS 20

Costs of Sprawl Savings By Region 21

PART I
—
BACKGROUND TO COSTS OF SPRAWL

THE COSTS OF SPRAWL

INTRODUCTION

The South Carolina Advisory Commission on Intergovernmental Relations (SCACIR) has commissioned a study on infrastructure needs and costs in the state. Projections of infrastructure have been presented and refined by considering technological and infrastructure program advances. (See Report 2A of this study.) This portion of the study seeks to refine further the costs of infrastructure provision by attempting to alter development patterns to achieve savings related to the costs of sprawl. Implicit in any cost savings noted is a willingness on the part of South Carolina counties to redirect development closer in at "design density" increases while reducing growth farther out and decreasing the density of the growth that does take place.

The report analyzes the differences in resource consumption and *costs* of uncontained versus contained development. The first situation is termed current or *sprawl* development; the second, *compact growth*. These costs will be viewed in four different substantive areas: (1) *infrastructure provision,* (2) *housing costs,* (3) *land consumption,* and (4) *municipal cost-revenue impacts.* The state of South Carolina and its constituent 46 counties and ten regions will be analyzed to determine whether differences in costs result from alternative future development patterns.

The study will review the literature of current development versus compact growth as it relates to the consumption or cost of infrastructure, housing, land, and public services (municipal operating costs). It will then present the results of growth pattern differences throughout the state as they relate to the above four areas of resource consumption.

Nationally, the capital costs of historical and current development patterns have usually been supported by the general population. Over the last decade, however, as new development costs have occurred, land development practice increasingly has shifted these costs to the specific increment of the population that contributed to them. This shifting of responsibility for costs requires a careful look at what contributes to them and whether they can be lessened.

The above discussion is the essence of municipal cost-revenue impacts. Cost-revenue impacts are the *operational,* as opposed to *capital,* costs that occur in municipalities as a function of land development. Operational costs are affected by a variety of factors including the demography of development, size of the unit being developed, income of a unit's occupants, and location and scale of development relative to other development. Thus, variations in operational cost-revenue impacts are not limited to just the pattern of development and, accordingly, are not impacted to the extent that capital costs are.

BACKGROUND

The section that follows discusses differences between current, or sprawl, development and an alternative, managed growth or compact development. These differences result largely from the use of land. In the first case, under

sprawl development, land is consumed as if it has considerable supply and there is little economic or societal cost in discarding or underusing old land in search of new. This approach to development often takes land in one-half acre or larger parcels to accommodate detached single-family homes and strip nonresidential centers along the outer beltways and spokes from the core of the metropolitan area. Inner-suburban and urban lands are skipped over en route to rural locations. This pattern is not willful; it has evolved over time from a lack of public awareness that there are societal consequences in consuming land this way. New infrastructure must be built to accommodate a scattered pattern of low-density land uses, yet there is no master blueprint depicting where or in what sequence these lands will be developed.

Another approach to land use, which is potentially more conservative in the use of land, infrastructure, and tax dollars, is *compact development,* or managed growth. This approach selects land closer to existing development, encourages both infill and redevelopment of core lands, and avoids internal development in areas which lack the necessary public facilities and services. When development takes place, natural habitats are buffered, uses are mixed if possible, and both residential and nonresidential uses, even if they exist alone, are clustered. This approach to land use has the potential for mitigating and reducing the impacts of development. It limits overall and fragile land consumption related to development, lowers requirements for road and water/sewer infrastructure, and, if implemented correctly, simultaneously reduces public service costs and housing prices.

CHARACTERISTICS OF SPRAWL AND COMPACT GROWTH

The purpose of examining the literature of sprawl versus compact growth is to classify and analyze what is known about growth management's effect on (1) land consumption, (2) public infrastructure provision, (3) private infrastructure (housing) costs, and (4) cost/revenue impacts (public service costs). Do the patterns of development spawned by compact growth save infrastructure costs? Do they drive up housing costs? Do they reduce the amount of land, including fragile areas, taken for development? Do they have a negative effect on local public service costs?

These four areas of examination are defined as follows. *Land consumption (including natural habitat losses)* involves the use of land to accommodate growth, with the focus on overall quantity of land converted to development uses as well as the conversion of agricultural acreage and the intrusion of development into fragile environmental areas. *Infrastructure, or public capital construction*, refers to the capital improvements necessitated by growth, including roads, utilities, schools, and other facilities (e.g., town hall, fire and rescue stations). *Private capital construction in the form of housing* is typically considered on a cost-per-residential-unit basis for a variety of shelter types, such as single-family detached homes, townhouses, garden units, and the like. *Cost-revenue impacts resulting from the operating costs of development* compare development in areas of excess service capacity with development in locations that would have to expand public services and infrastructure. Cost-revenue impacts

include the longer-run savings in operating costs both regionally and in a single community.

Most studies summarized here contrast two alternative development futures. One alternative represents existing development patterns extended into the future; it is termed current, or *sprawl,* development. Development of this type typically includes subdivision-style residential development and strip nonresidential development consisting of (1) skipped-over, noncontiguous residential land development, in the form of 0.5 to 1.5 acre lots, and (2) nonresidential development of floor-area ratios* of 0.20 or less. Sprawl development continues prior patterns of agricultural and other fragile land consumption, significant road/pavement construction, and high amounts of water and sewer infrastructure provision. Development of this type reportedly contributes to both higher housing costs for new households and negative fiscal impacts to host public service jurisdictions.

Characteristics of Sprawl

Development that is:

- very low density
- automobile dependent
- uneconomical for utility expansion or extension of other public services
- embodied in scattered rural subdivisions
- characterized by strip residential development along county roads
- detrimental to rural character and small town atmosphere
- insensitive to promoting retail shopping opportunities downtown
- in the form of strip commercial development at the edges of town
- land consumptive
- energy inefficient
- characterized by a high ratio of road surface to development served

(Michigan Society of Planning Officials 1995.)

The second alternative is called *compact growth*, or growth management. This type of development seeks to contain most new growth around existing centers and to limit the intensity of development in rural and sensitive environmental areas. It also seeks to save more prime agricultural and fragile lands, prevent wetland encroachment, buffer streams and other water bodies, and protect open water and natural habitats. Further, it seeks to reduce road construction and water/sewer infrastructure provision through more contained cluster development and, in some cases, mixed-use development. Achieving these goals means increasing the share and density of development close to existing development and decreasing the share and density of development in the outer, more rural and undeveloped areas of the county or metropolitan area. Density increases and decreases are planned in a way that does not alter regional housing costs, increase public service outlays, or limit revenues of public service providers.

Characteristics of Compact Growth

Development that is:

- economical in public service provision
- low to moderate density, with some clustering of uses

* Floor-area ratio (FAR) is the gross floor area of all buildings or structures on a lot divided by the total lot area.

- characterized by a distinct edge between urban and rural areas
- typified by farmland, forest, and other natural open spaces surrounding developed areas
- responsive to residents who wish to walk or bike to shopping areas, schools, and public buildings
- sensitive to residential neighborhoods surrounding defined centers
- of a form wherein most commercial development is downtown or in planned clusters

(Michigan Society of Planning Officials 1995.)

COMPACT GROWTH AND ITS RESOURCE SAVINGS AS AN ALTERNATIVE TO SPRAWL

Proponents of compact growth point to the economic savings associated with this type of development. For instance, a Florida study found that "compact, infill, and higher density development is more efficient to serve than scattered, linear, and lower density sprawl" by 10 to 25 percent, according to category of infrastructure provided (Duncan et al. 1989, 21). *The Costs of Sprawl* (Real Estate Research Corporation 1974) reported similar findings more than two decades ago. This study is cited in some of the most current research on sprawl development's disadvantages.

The most comprehensive *recent* assessment of the economies afforded by compact development is that conducted by a team of academic and professional researchers from Rutgers University (Burchell et al. 1992a). This study analyzed the impacts of the then-pending New Jersey State Development and Redevelopment Plan. Findings concluded that the state of New Jersey could save $1.3 billion in infrastructure costs for roads, utilities, and schools over a twenty-year period if a state plan encouraging compact growth were followed rather than continuing the patterns of outward development prevalent at that time.

Capital (Public Infrastructure) Costs: Current Development Trends versus Managed Growth

The land development literature has long been interested in the relationship between land-use patterns and infrastructure costs (Burchell and Listokin 1990, 75). Although there are gaps in what is known, a number of studies support the contention that compact growth, by fostering infill and higher density development, can realize cost savings in capital facility provision. Initially, attention focused on the association between density and on-site capital improvements, such as sidewalks, curbs, local streets, and so on. Not surprisingly, studies showed that the on-site infrastructure outlay per unit would be reduced as density increased, since localized improvements would be "amortized" over a larger number of units. To illustrate, the cost for sidewalks essentially would be halved for single-family detached homes with fifty-foot frontages, compared to those with 100-foot frontages.

Of the several investigations of this topic, three major studies stand out: James Duncan and Associates, The *Search for Efficient Urban Growth Patterns* (1989); the literature synthesis by James E. Frank (1989), *The Costs of Alternative Development Patterns: A Review of the Literature;* and the Rutgers University studies by Robert W. Burchell and others, *Impact Assessment*

of the New Jersey Interim State Development and Redevelopment Plan (Burchell et al. 1992a) and *Impact Assessment of the New Jersey Interim State Development and Redevelopment Plan: Supplemental AIPLAN Assessment* (Burchell et al. 1992b). In the South Carolina analysis, the synthesis of infrastructure savings potentially available from managed growth is based on the investigations of Duncan, Frank, and Burchell.

As would be expected, the findings of these three studies differ somewhat. For instance, compact growth allows for a 7 percent school infrastructure saving according to Duncan, whereas Frank and Burchell find 1 percent and 3 percent savings, respectively. The commonalities in the direction and order of magnitude of the findings are much stronger, however, than these individual differences. Among the findings: relative to sprawl development, compact growth requires 75 percent of the infrastructure cost for roads; 95 percent of the infrastructure costs for schools; 85 percent of the infrastructure costs for utilities; and is at rough parity (100 percent) for the "other" capital category.

Capital (Private Housing) Costs: Current Development Trends versus Compact Growth

The growth control studies cited earlier in the literature review analyzed the price effects of growth controls in a given community. What happens to overall housing costs in a larger area governed by growth controls where development is restricted in certain localities (e.g., areas with fragile lands) but encouraged in others (areas with existing or excess infrastructure capacity, such as urban centers or suburban infill locations)? The only study to date that has considered housing affordability under managed growth on a wide geographic basis is the Rutgers University impact assessment (Burchell et. al 1992a, 1992b).

The Burchell Study

Researchers examined the statewide consequences of housing affordability under sprawl development compared to compact growth. The study team employed a housing-cost model to determine differences in housing prices in various locations. The housing-cost model factored in the land component of housing price, allowing this cost component to rise or fall according to the amount of land included in the larger lot-size locations of limited growth areas, or the reduced lot-size locations of more active growth areas. Additionally, the model factored in differences in housing prices across these locations. Reflecting the above, it was found that *land preservation efforts serve to raise regional housing costs if they are not counteracted by increases in densities* in areas that accommodate new development near already developed areas.

The results of the Burchell study follow.

1. Relative to sprawl development, where growth was occurring in New Jersey's outlying locations and often encroaching on environmentally sensitive areas, compact development would contain growth in such areas or would allow it only at lower densities (i.e., to be environmentally compatible).
2. Because of the land development constraints under compact growth, the price per acre of land would decrease in such locations.

3. Although the price per acre would decline, a housing unit would occupy significantly more land in rural and environmentally sensitive areas under compact growth (because development would be allowed only at much lower densities), causing an overall increase in housing prices.
4. A contrary effect would occur, however, in other portions of the state under the compact growth alternative. For instance, a larger share of development would take place near existing centers, in contrast to the deconcentration occurring under current development. Consequently, housing prices would decrease in these centers and in redeveloping/infill areas as a result of the inherently higher density of the housing mix proposed there (i.e., a higher share of attached single-family and multifamily units).
5. The specific findings of the Burchell study may be summarized as follows: Under current development trends, the median housing price in constant 1990 dollars was $172,657; under compact growth, the price would be $162,162—$10,495 less, representing a savings of slightly more than 6 percent for the latter alternative.

Summary

When the full array of housing construction costs under compact growth compared to current development trends is examined—taking into account both instances of rising and lowered costs, as the New Jersey impact assessment considered—it is found that compact growth serves to moderate rather than increase the cost of housing.

On the other hand, when building permits are limited but there is no provision to offset this constraint with allowance for some housing at slightly higher densities, housing costs will rise under compact growth plans. This occurred in Davis and Petaluma, California, and in Boca Raton, Florida (Fischel 1990).

Land Consumption: Current Development Trends versus Compact Growth

The Rutgers University impact assessment (Burchell et al. 1992a, 1992b) examined overall land consumption under the two development scenarios of current and compact growth and further considered the relative conversion of agricultural acreage and impacts on fragile lands. Agricultural lands included such categories as cropland that is harvested, lands in permanent pasture, and woodlands that can be used for agricultural purposes. Fragile land encompassed floodplains and wetlands, acreage with steep slopes or with critical habitat designation, aquifer recharge areas and critically sensitive watersheds, and stream buffers.

The analysis employed a land-consumption model at the local level to examine differences between current and compact growth scenarios. This model allowed future projections of households and jobs to be converted to the demand for residential and nonresidential structures, and ultimately to the demand for residential and nonresidential land. Historical rates of farmland takings were applied to land consumed under the sprawl development future, and goals of farmland retention were applied under the compact growth scenario. A similar procedure was used for fragile land-

consumption comparisons. The model, using different densities, development locations, and housing types for current versus compact growth, calculated the total agricultural and fragile lands consumed under each development alternative and expressed these as well as their differences in acres. The results are described below.

The analysis found that there was more than enough land statewide to accommodate twenty-year development projections (1990-2010) of persons (520,000), households (431,000), and employees (654,000) under both current and compact growth alternatives. As of 1990, there was a total of two million acres available for development in the state of New Jersey. Of these two million acres, development between 1990 and 2010 under current conditions would consume 292,079 acres, whereas compact growth that accommodated the same level of growth (persons, households and jobs) would consume only 117,607 acres—174,472 fewer than under current development (Burchell et al. 1992b). Thus, compact growth's overall land drawdown was 60 percent less than that of current development.

The impact assessment further found that compact growth would have the environmental advantage of preserving greater levels of fragile and agricultural lands. Reflecting historical rates of loss, under current conditions 36,482 acres of fragile lands would be consumed for development; by contrast, under compact growth the consumption of these lands would drop to 7,150 acres or by 83 percent. Thus, compact growth in New Jersey could not only accommodate future development but would preserve 30,000 acres of fragile environmental lands. In a similar vein, the study found that under current development 108,000 agricultural acres would be consumed during the period 1990-2010, whereas under compact growth, only 66,000 agricultural acres would be converted. This represented a savings of 42,000 acres, or 40 percent of prime agricultural land. The savings in New Jersey were more pronounced than findings elsewhere due in part to the differences in density of areas designated as centers compared to densities of the prevailing development pattern in New Jersey.

Fiscal Impacts and Current Versus Compact Development

In theory, cost-revenue impacts and observed differences under current trends versus compact growth depend on two factors. The first is the ability to influence the type of development. To the degree that dwelling type can be altered by compact versus current development in subregional settings, the demographics and the resulting public service costs of development will change. A second important factor is the ability to influence the intensity and scale of new neighborhoods. If compact development provides more contained development patterns, infrastructure provision will be less. So too will the annual debt service on capital costs for roads, water/sewer lines, and so on, as well as the annual maintenance costs associated with these facilities. A further important factor is the location where development takes place. If it is located near existing development, excess service capacity may be drawn upon. If development is skipped over, providing new public service infrastructure will almost always be more expensive than extending existing facilities.

Only the second category of influence—the intensity and compactness of new neighborhoods—should be relied heavily upon for areally larger applications of growth management (i.e., the regional level). With regard to the first category, it is difficult to influence housing type (and thus, demographics) for an entire state. At the subregional level, the ability to influence housing choice leads potentially to the export of housing types to other subregional areas. In other words, trying to save public service costs by influencing the demographics of occupied structures may drive those who would have occupied the original structures elsewhere to reside (sending up service costs there). What's more, the demographics of the altered housing type may be the same as the first (maintaining high service costs in the original location).

In one of the only studies since the 1974 *Costs of Sprawl* study to view the effects of different development patterns on public service costs, the Rutgers University study (Burchell et al. 1992a, 1992b) used a cost-revenue model to view the effects of current versus compact development. The Rutgers fiscal impact model estimated the number of people, employees, and students that would be attracted by development under different development scenarios and projected future costs versus revenues. Although population and employment projections did not vary between alternatives at the regional and state levels, at the municipal level there were significant differences. In the scenarios analyzed for compact growth, urban communities with slack service capacity received more growth than rural areas with lesser amounts of public service infrastructure. The reduced infrastructure provision and the potentially reduced annual maintenance on this infrastructure calculated to more positive fiscal impacts for compact growth.

The Rutgers study in New Jersey found that by containing population and jobs in already developed areas and by creating or expanding centers in newly developing areas, the State Plan (compact growth) offered an annual $112 million (or 2 percent) fiscal advantage to municipalities. This advantage reflected the ability under the managed growth scenario to draw on usable excess operating capacity in already developed areas as well as efficiencies of service delivery. For instance, fewer lane-miles of local roads would have to be built under the compact growth alternative, thus saving future municipal public works maintenance and debt service costs. Public school districts would realize a $286 million (or 2 percent) annual financial advantage under the State Plan, again a reflection of drawing on usable excess public school operating capacity and other service and fiscal efficiencies realized from the redirection of population via compact growth. Thus, municipal and school district providers of public services could be ahead fiscally by nearly $400 million annually under compact compared to current development while supplying a similar quality of services.

Under current development, New Jersey's school districts would have to provide 288,000 new pupil spaces to the year 2010 (365,000 gross need less 77,000 usable excess spaces); for compact development, the need was a somewhat lower 278,000 pupil spaces, reflecting some excess space in central locations. Overall, if new space had to

be built to accommodate all new students, costs of new school facilities would be approximately $5.3 billion under current development trends compared to $5.1 billion under compact development. Thus, $200 million (or approximately 3 percent) potentially could be saved due to somewhat more excess capacity in closer-in areas being drawn upon by compact growth compared to what could be drawn upon by current development trends in suburban and rural areas (Burchell et al. 1992b).

Summary of Development Pattern Impacts

This report has reviewed the literature with regard to compact growth versus current development trends for public/private capital costs (infrastructure requirements/costs and housing costs), land consumption, and cost-revenue impacts. The most extensive literature concerns public capital needs/costs.† The empirical investigations with respect to the remaining three subject areas are sparser. The findings may be summarized as follows:

◊ CAPITAL (PUBLIC INFRASTRUCTURE) COSTS
Compact growth relative to current development is:
- 75 percent as expensive with respect to roads
- 95 percent as expensive with respect to schools
- 85 percent as expensive with respect to utilities
- at parity with respect to other infrastructure

◊ CAPITAL (PRIVATE HOUSING) COSTS
Compact growth relative to current development:
- doesn't increase housing costs and, in fact, may afford a small (i.e., less than 6 percent) savings

◊ LAND CONSUMPTION
Compact growth relative to current development consumes:
- 40 percent as much land overall
- 60 percent as much of agricultural acreage and 17 percent the level of fragile lands

◊ FISCAL IMPACTS
Compact growth relative to current development:
- is less costly on an annual basis to both municipality and school district by about 2–3 percent

Applying the Results of Savings to South Carolina Infrastructure Costs

The foregoing results of infrastructure, land, housing cost, and municipal cost revenue savings are corroborated by similar studies undertaken in Lexington, Kentucky, the Delaware Estuary, and Michigan. The results of these more recent studies are more applicable to the State of South Carolina because they have been undertaken in rural and suburbanizing locations. Figure 1 shows the results for the categories of infrastructure shown above.

† Three empirical studies are summarized; for other areas of impact, the New Jersey State Plan (AIPLAN) analysis (Burchell et al. 1992b) is the primary source.

Figure 1

NATURAL AND MAN-MADE INFRASTRUCTURE SAVINGS:
COMPACT GROWTH OVER CURRENT DEVELOPMENT

Area of Impact	Lexington, KY and Delaware Estuary	Michigan	South Carolina
Developable Land	20.5-24.2%	15.5% 9,733 acres	15%
Agricultural Land	18-29%	17.4% 7,454 acres	18%
Frail Land	20-27%	20.9% 1,984 acres	22%
Infrastructure Roads (local)	14.8-19.7%	12.4% (190 Lane miles)	12%
Utilities (water/sewer)	6.7-8.2%	13.7% 10,400 hookups	13%
Housing Costs	2.5-8.4%	6.8% $10,930	7%
Cost-Revenue Impacts	6.9%	3.5% $1.85 million (annually)	5%

These savings are applied to the specific areas of infrastructure that they impact and result in an overall infrastructure savings of approximately 6.0 percent. The overall savings amount to $2.7 billion when applied to a total of $42.8 billion.

The remaining infrastructure need that cannot be addressed by technology or land pattern changes is approximately $40 billion.

The savings is 6.0 percent overall because all categories of infrastructure are not impacted by costs of sprawl savings.

SAVINGS FOUND IN THE COSTS OF SPRAWL APPLIED TO INFRASTRUCTURE CATEGORIES OF SOUTH CAROLINA

The savings noted above are applied to infrastructure categories after gross infrastructure costs have already been reduced by savings potentially available from new technologies, alternative infrastructure approaches, and the regional sharing of infrastructure. Thus, the number to which costs of sprawl savings are applied is reduced by 25 percent prior to their application. This obviously reduces the effect of the costs of sprawl savings. Nonetheless, costs of sprawl savings are significant—$2.7

billion. Further, since fiscal impact savings are annual and the savings due to costs of sprawl is about $250 million, the 20-year impact of these annual savings is almost $5 billion. Finally, these particular savings are available primarily to county governments and school districts as opposed to specific agencies of state government. Thus, the savings that accrue—primarily in county roads, county water/sewer lines, and county and school district operating expenses—are retained in taxpayers' pockets rather than reallocated to another area of state government.

THE QUID PRO QUO FOR COSTS OF SPRAWL SAVINGS

The quid pro quo for costs of sprawl savings is an obligation on the part of county and municipal governments to channel growth to locations where public service provision will be most efficient and away from areas where it will be least efficient. The savings discussed in this report are predicated upon retaining one-half of the growth that currently takes place in skipped-over rural areas in areas closer in to already developed areas. In so doing, those areas that had been receiving growth and had to develop significant infrastructure to accommodate growth will receive less growth and will have less of a requirement for infrastructure. On the other hand, areas to which more growth is now being directed must increase their densities by about 20 percent in the process of accommodating this growth. This low-impact "design density" increase allows the remaining growth that goes to sprawl locations to do so at density reductions of 50 percent of former levels. Thus, not only does less growth go to peripheral areas, but the growth that is directed there will be at significantly reduced densities.

THE IMPORTANCE OF GROWTH MANAGEMENT

Sprawl and its costs cannot be brought under control without land management concepts that alter the location of this growth. These include: purchase/transfer of development rights (PDR/TDR); the establishment of center and urban growth boundaries; tax increment financing districts; transportation corridors; mixed-use and planned-unit development districts; and other growth management devices. The above techniques, through zoning or incentive, create the opportunity to control both tempo (timing) and sequence (location) of development. This is essential to orderly and cost-efficient growth.

The difference between growth management and growth control is that growth management recognizes the benefits of growth and attempts to influence its location. Growth management redirects a portion of growth away from peripheral areas and to locations closer in. It also recognizes the concept of rural centers and their need for sustained growth.

A DEMONSTRATION PROGRAM FOR GROWTH MANAGEMENT

Little of the above can be accomplished without a serious look at the growth management techniques listed above and their territorial expression on both the county and state maps of South Carolina. This type of cost-efficient land management could begin on a voluntary basis as part of a demonstration program for counties in a particular region. State funding could be made available to

undertake such a project in a region. Study and technique development and implementation could proceed on a trial basis with regular review and monitoring by state agencies and other local governments. At the end of the trial period, the demonstration counties could decide to accept or reject the management scheme, and a similar decision could be made by other counties and the state. In this type of demonstration, growth management activities could be linked and integrated with capital facilities planning and development. In this way, both growth and the availability of public services would follow a similar course. This would enable the types of infrastructure savings noted earlier in this section.

CONCLUSION

This report has sought to present what the literature has found concerning the costs of two alternative growth patterns (current development versus compact growth) and to view these potential savings within a South Carolina context. Of particular significance is the finding that a group of citizens making decisions about future public policy, by choosing compact growth, could potentially reduce land consumption and road building in their living environment by significant amounts. These are important societal accomplishments by any measure.

Ongoing operating costs for roads and infrastructure might also be reduced if a community's capital commitments were ultimately diminished. Additionally, by preserving land in the process of development, under compact growth, there is less need to acquire land for parks and recreation as it becomes less plentiful and more costly. Finally, by containing development around existing centers, these centers might be maintained as healthier entities, better able to pay their taxes in full. All of this could contribute to lower taxpayer costs in the region.

REFERENCES AND SELECTED BIBLIOGRAPHY

Aberger, Will, and L. Propst. 1992. *Successful Communities: Managing Growth to Protect Distinctive Local Resources.* Washington, DC: The Conservation Foundation.

Audirac, I., A. H. Shermyen, and M. T. Smith. 1990. "Ideal Urban Form and Visions of the Good Life: Florida's Growth Management Dilemma." *Journal of the American Planning Association* 56 (Autumn): 470-482.

Bookout, L., and J. Wentling. 1988. "Density by Design." *Urban Land* 47: 10-15.

Bourne, Larry S. 1992. "Self-Fulfilling Prophecies? Decentralization, Inner City Decline, and the Quality of Urban Life." *Journal of the American Planning Association* 58: 509-513.

Burchell, Robert W. 1990. "Fiscal Impact Analysis: State of the Art and State of the Practice" in Susan G. Robinson's *Financing Growth: Who Benefits? Who Pays? How Much?* Washington, DC: Government Finance Research Center.

Burchell, Robert W. and David Listokin. 1978. *The Fiscal Impact Handbook: Estimating Local Costs and Revenues of Land Development.* New Brunswick, New Jersey: Rutgers University, Center for Urban Policy Research.

Burchell, Robert W., and David Listokin. 1990. *Fiscal Studies.* Report to the Governor's Commission on Growth in the Chesapeake Bay Region, Annapolis, Maryland: 2020 Commission.

Burchell, Robert W. and David Listokin. 1991. *Fiscal Impact Analysis: A Manual and Software for Builders and Developers.* Washington, DC: National Association of Homebuilders.

Burchell, Robert W., and David Listokin. 1994a. "Fiscal Impact Procedures and the Fiscal Impact Hierarchy." Paper prepared for the Association for Budgeting and Financial Management, Annual Conference on Public Budgeting and Finance, Washington, D.C. October.

Burchell, Robert W., and David Listokin. 1994b. "The Economic Effects of Trend versus Vision Growth in the Lexington Metropolitan Area." Report prepared for Bluegrass Tomorrow, Lexington, Kentucky. November.

Burchell, Robert W., and David Listokin. 1995. "Land, Infrastructure, Housing Costs, and Fiscal Impacts Associated with Growth: The Literature on the Impacts of Traditional Versus Managed Growth." Paper prepared for "Alternatives to Sprawl" Conference, The Brookings Institution, Washington, D.C. March.

Burchell, Robert W., David Listokin, and William R. Dolphin. 1993. *The Development Impact Handbook.* Washington, DC: The Urban Land Institute.

Burchell, Robert W., et al. 1992a. *Impact Assessment of the New Jersey Interim State Development and Redevelopment Plan, Report II: Research Findings.* Report prepared for New Jersey Office of State Planning, Trenton. February 20.

Burchell, Robert W., et al. 1992b. *Impact Assessment of the New Jersey Interim State Development and Redevelopment Plan, Report III: Supplemental AIPLAN Assessment.* Report prepared for New Jersey Office of State Planning, Trenton. April 30.

Calthorpe, Peter G. 1993. *The Next American Metropolis.* Princeton: Princeton University Press.

Cervero, Robert. 1986. *Suburban Gridlock.* New Brunswick, NJ: Center for Urban Policy Research, Rutgers University.

Coughlin, Robert E., and John C. Keene. 1981. *The Protection of Farmland: A Reference Guidebook for State and Local Governments.* Study prepared for the National Agricultural Lands Study. Amherst, MA: Regional Science Research Institute.

Dahl, T.E., 1990. *Wetlands Losses in the United States: 1780s–1980s.* Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service.

Delaware Estuary Program. 1995. *Comprehensive Conservation and Management Plan.* January.

Downs, Anthony. 1994. *New Visions for Metropolitan America.* Cambridge, MA: Lincoln Institute and The Brookings Institution.

Duncan, James, et al. 1989. *The Search for Efficient Urban Growth Patterns.* Tallahassee, FL: Florida Department of Community Affairs.

Dyckman, John W. 1976. "Speculations on Future Urban Form." Working Paper, Johns Hopkins University, Center for Metropolitan Planning and Research.

ECONorthwest. June 1994. *Evaluation of No-Growth and Slow-Growth Policies.* Eugene. OR.

Ewing, R. 1995. *Best Development Practices: Doing the Right Thing and Making Money at the Same Time.* Chicago: American Planning Association.

Fischel, W. A. 1990. "Do Growth Controls Matter?' Cambridge, MA: Lincoln Institute of Land Policy. May.

Frank, James E. 1989. *The Costs of Alternative Development Patterns: A Review of the Literature.* Washington, D.C.: Urban Land Institute.

Gordon, Peter, and Harry W. Richardson. 1994a. "Sustainable Congestion," in J. Brotchie, ed., *Cities in Competition: The Emergence of Productive and Sustainable Cities for the 21st Century.*

Gordon, Peter, and Harry W. Richardson. 1994b. *Geographic Factors Explaining Worktrip Length Changes.* Prepared for the U.S. Department of Transportation, Federal Highway Administration.

Gordon, Peter, Harry W. Richardson, and Myung-Jin Jun. 1991. "The Commuting Paradox: Evidence from the Top Twenty." *Journal of the American Planning Association* 57: 416-420.

Greene, David L. and Donald N. Jones. 1995. "The Full Costs and Benefits of Transportation: Conceptual and Theoretical Issues." Paper presented at the Conference on the Full Social Costs and Benefits of Transportation.

Hartshorn, Truman A., and Peter O. Muller. 1992. "The Suburban Downtown and Urban Economic Development Today." In Edwin S. Mills and John F.

McDonald (eds.), *Sources of Metropolitan Growth.* New Brunswick, NJ: Rutgers University, Center for Urban Policy Research.

Herson, Lawrence J. R. 1992. "The New Suburbanization: Challenge to the Central City." *Annals of the American Academy of Political and Social Science* 522: 184.

Isard, Walter, and Robert E. Coughlin. 1957. *Municipal Costs and Revenues Resulting from Growth.* Wellesley, MA: Chandler-Davis.

Kain, John. 1988. "Choosing the Wrong Technology: Or How to Spend Billions and Reduce Transit Use." *Journal of Advanced Transportation* 21.

Katz, L., and K. Rosen. 1987. "The Interjurisdictional Effects of Growth Controls on Housing Prices. *Journal of Law and Economics* 30 (April): 149–60.

Krieger, Alex, ed. 1991. *Towns and Town-making Principles: The Work of Andres Duany and Elizabeth Plater-Zyberk.* New York: Rizzoli International Publishers.

Krote, James J. 1992. "Is Downtown Worth Saving?" *Planning* 58, 8: 148-62.

Michigan Society of Planning Officials. 1995. *Patterns on the Land: Our Choices—Our Future*. Rochester, Michigan.

Mills, David E. 1981. "Growth, Speculation, and Sprawl in a Monocentric City." *Journal of Urban Economics* 10: 201-26.

Mills, Edwin S., and John F. McDonald. 1992. "Editors' introduction." In Edwin S. Mills and John F. McDonald (eds.), *Sources of Metropolitan Growth.* New Brunswick, NJ: Rutgers University, Center for Urban Policy Research.

Muller, Peter O. 1986. "Transportation and Urban Form: Stages in the Spatial Evolution of the American Metropolis. In Susan Hanson (ed.), *Geography of Urban Transportation.* New York: Guilford Press.

Nelessen, Anton C. 1994. *Visions for a New American Dream: Process, Principles, and an Ordinance to Plan and Design Small Urban Communities.* Chicago: American Planning Association.

New Jersey State Planning Commission. 1991. *Communities of Place: The Interim State Development and Redevelopment Plan for the State of New Jersey.* July.

Ohls, James C., and David Pines. 1975. "Discontinuous Urban Development and Economic Efficiency." *Land Economics* 3 (August): 224-34.

Parsons Brinckerhoff Quade and Douglas and ECONorthwest. Forthcoming 1997. *A Framework for Evaluating the Impacts of Alternative Urban Forms.* Washington, DC.

Peiser, Richard B. 1989. "Density and Urban Sprawl." *Land Economics* 65: 193-204.

Peterson, George E., and Wayne Vroman (eds.) 1992. "Foreword." *Urban Labor Markets and Job Opportunities.* Washington, DC: Urban Institute Press.

Real Estate Research Corporation. 1974. *The Costs of Sprawl: Environmental and Economic Costs of Alternative Residential Development Patterns at the Urban Fringe.* Washington, D.C.: U.S. Government Printing Office.

Schwartz, S. I., D. E. Hansen, and R. Green. 1981. "Suburban Growth Controls and the Price of New Housing. *Journal of Environmental Economics and Management* 8 (December): 303–20.

Schwartz, S. I., P. M. Zorn, and D. E. Hansen. 1989. "Research Design Issue and Pitfalls in Growth Control Studies. *Land Economics* 65 (February): 87–88.

Siemon, Larsen and Purdy. 1990. *Crossroads: Two Growth Alternatives for Virginia Beach. Virginia Beach (VA) Growth Management Study.* Chicago, Illinois.

Tischler & Associates, Inc. 1994. *Marginal Cost Analysis of Growth Alternatives—King County, Washington.* Bethesda, MD.

Wheaton, William L., and Morton J. Schussheim. 1955. *The Cost of Municipal Services in Residential Areas.* Washington, D.C.: U.S. Department of Commerce.

Windsor, Duane. 1979. "A Critique of *The Costs of Sprawl.*" *Journal of the American Planning Association* 45 (March): 279-92.

York, Marie L. 1989. *Encouraging Compact Development in Florida.* Florida Atlantic University–Florida International University Joint Center for Environmental and Urban Problems, Fort Lauderdale, Florida.

Zorn, P. M., D. E. Hansen, and S. I. Schwartz. 1986. "Mitigating the Price Effects of Growth Control: A Case Study of Davis, California. *Land Economics* 62 (February): 47–57.

PART II
—
STATEWIDE COSTS OF SPRAWL SAVINGS

Figure 2
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
STATE TOTAL

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	16,998	1,235	7	471	3	1,706	10	15,292
Bridges	2,413	377	16	9	0	386	16	2,027
Public Transportation	1,022	-	-	-	-	-	-	1,022
Freight (Rail and Road)	246	-	-	-	-	-	-	246
Ports	1,352	-	-	-	-	-	-	1,352
Aviation (Including Air Freight)	576	-	-	-	-	-	-	576
Other Transportation Facilities	16	2	10	0	2	2	12	14
Total	**22,623**	**1,613**	7	**481**	2	**2,094**	9	**20,529**
COMMERCE								
Economic Development	1,355	2	0	0	0	2	0	1,353
Farmland Retention	58	1	2	0	1	1	2	57
Energy	313	-	-	-	-	-	-	313
Telecommunications	1,084	-	-	-	-	-	-	1,084
Total	**2,810**	**3**	0	**1**	0	**4**	0	**2,806**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	1,004	11	1	21	2	33	3	971
Justice (Courts)	377	3	1	6	2	9	2	368
Public Admin./ Instit./ Hsg.	408	5	1	10	3	15	4	394
Total	**1,789**	**19**	1	**38**	2	**57**	3	**1,732**
EDUCATION								
Public Education	5,028	11	0	101	2	112	2	4,915
Higher Education	2,484	-	-	-	-	-	-	2,484
Total	**7,512**	**11**	0	**101**	1	**112**	1	**7,399**
HEALTH								
Public Health Care	903	-	-	-	-	-	-	903
Water Supply	1,724	5	0	134	8	139	8	1,585
Waste Water Disposal	2,222	47	2	121	5	168	8	2,054
Solid Waste Management	798	-	-	-	-	-	-	798
Total	**5,646**	**52**	1	**255**	5	**307**	5	**5,339**
RECREATION AND CULTURE								
Recreational Facilities	428	-	-	-	-	-	-	428
Arts / Library	342	-	-	-	-	-	-	342
Historic Resources	322	-	-	-	-	-	-	322
Total	**1,092**	-	-	-	-	-	-	**1,092**
ENVIRONMENT								
Storm Water Management	562	16	3	28	5	45	8	518
Shore and River Protection	340	-	-	-	-	-	-	340
Sensitive Land and Water	200	16	8	16	8	32	16	169
Open Space	168	2	1	4	3	6	4	161
Air Pollution	37	-	-	-	-	-	-	37
Total	**1,307**	**34**	3	**49**	4	**83**	6	**1,224**
OVERALL TOTAL	**42,779**	**1,733**	4	**924**	2	**2,656**	6	**40,123**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

PART III
—
REGIONAL COSTS OF SPRAWL SAVINGS

Figure 2A
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
UPPER SAVANNAH REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	966	74	8	17	2	91	9	875
Bridges	115	16	14	1	1	17	14	98
Public Transportation	49	-	-	-	-	-	-	49
Freight (Rail and Road)	9	-	-	-	-	-	-	9
Ports	-	-		-		-		-
Aviation (Including Air Freight)	10	-	-	-	-	-	-	10
Other Transportation Facilities	0	0	13	0	1	0	14	0
Total	**1,149**	**90**	8	**18**	2	**107**	9	**1,041**
COMMERCE								
Economic Development	122	0	0	0	0	0	0	121
Farmland Retention	4	0	1	0	0	0	1	3
Energy	23	-	-	-	-	-	-	23
Telecommunications	35	-	-	-	-	-	-	35
Total	**183**	**0**	0	**0**	0	**0**	0	**182**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	73	1	1	2	2	3	3	71
Justice (Courts)	23	0	1	0	2	1	2	22
Public Admin./ Instit./ Hsg.	24	0	1	1	3	1	4	23
Total	**120**	**1**	1	**3**	2	**4**	3	**116**
EDUCATION								
Public Education	160	0	0	3	2	3	2	157
Higher Education	31	-	-	-	-	-	-	31
Total	**191**	**0**	0	**3**	2	**3**	2	**188**
HEALTH								
Public Health Care	29	-	-	-	-	-	-	29
Water Supply	63	0	0	4	6	4	6	59
Waste Water Disposal	104	3	3	4	4	7	7	97
Solid Waste Management	43	-	-	-	-	-	-	43
Total	**239**	**3**	1	**8**	3	**11**	5	**228**
RECREATION AND CULTURE								
Recreational Facilities	21	-	-	-	-	-	-	21
Arts / Library	10	-	-	-	-	-	-	10
Historic Resources	20	-	-	-	-	-	-	20
Total	**51**	-	-	-	-	-	-	**51**
ENVIRONMENT								
Storm Water Management	23	1	3	1	4	2	7	22
Shore and River Protection	18	-	-	-	-	-	-	18
Sensitive Land and Water	12	1	7	1	11	2	18	10
Open Space	10	0	2	0	4	1	6	10
Air Pollution	2	-	-	-	-	-	-	2
Total	**65**	**2**	3	**3**	4	**4**	7	**61**
OVERALL TOTAL	**1,997**	**96**	5	**34**	2	**130**	7	**1,867**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2B
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
PEE DEE REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	1,148	84	7	20	2	104	9	1,044
Bridges	180	28	16	0	0	28	16	152
Public Transportation	45	-	-	-	-	-	-	45
Freight (Rail and Road)	15	-	-	-	-	-	-	15
Ports	-	-		-		-		-
Aviation (Including Air Freight)	23	-	-	-	-	-	-	23
Other Transportation Facilities	0	0	11	0	1	0	12	0
Total	**1,412**	**112**	8	**20**	1	**132**	9	**1,280**
COMMERCE								
Economic Development	143	0	0	0	0	0	0	143
Farmland Retention	4	0	1	0	0	0	1	4
Energy	19	-	-	-	-	-	-	19
Telecommunications	78	-	-	-	-	-	-	78
Total	**245**	**0**	0	**0**	0	**0**	0	**244**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	95	1	1	1	1	3	3	92
Justice (Courts)	28	0	0	0	1	0	1	28
Public Admin./ Instit./ Hsg.	36	0	1	1	2	1	3	35
Total	**159**	**2**	1	**2**	1	**4**	3	**155**
EDUCATION								
Public Education	215	0	0	3	1	4	2	212
Higher Education	82	-	-	-	-	-	-	82
Total	**297**	**0**	0	**3**	1	**4**	1	**294**
HEALTH								
Public Health Care	38	-	-	-	-	-	-	38
Water Supply	89	0	0	5	6	6	6	83
Waste Water Disposal	173	3	2	6	3	9	5	164
Solid Waste Management	146	-	-	-	-	-	-	146
Total	**445**	**3**	1	**11**	2	**14**	3	**431**
RECREATION AND CULTURE								
Recreational Facilities	29	-	-	-	-	-	-	29
Arts / Library	16	-	-	-	-	-	-	16
Historic Resources	17	-	-	-	-	-	-	17
Total	**62**	-	-	-	-	-	-	**62**
ENVIRONMENT								
Storm Water Management	28	1	3	1	4	2	7	26
Shore and River Protection	6	-	-	-	-	-	-	6
Sensitive Land and Water	6	0	4	0	5	1	9	6
Open Space	11	0	1	0	2	0	2	11
Air Pollution	2	-	-	-	-	-	-	2
Total	**54**	**1**	2	**2**	3	**3**	5	**51**
OVERALL TOTAL	**2,674**	**119**	4	**38**	1	**157**	6	**2,517**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2C
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
CATAWBA REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	1,181	75	6	31	3	106	9	1,075
Bridges	126	17	14	0	0	18	14	108
Public Transportation	71	-	-	-	-	-	-	71
Freight (Rail and Road)	12	-	-	-	-	-	-	12
Ports	-	-		-		-		-
Aviation (Including Air Freight)	9	-	-	-	-	-	-	9
Other Transportation Facilities	1	0	15	0	1	0	16	1
Total	**1,399**	**93**	7	**31**	2	**124**	9	**1,276**
COMMERCE								
Economic Development	109	0	0	0	0	0	0	109
Farmland Retention	4	0	2	0	1	0	3	4
Energy	18	-	-	-	-	-	-	18
Telecommunications	35	-	-	-	-	-	-	35
Total	**167**	**0**	0	**0**	0	**0**	0	**167**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	112	1	1	3	2	4	4	108
Justice (Courts)	26	0	1	1	2	1	3	25
Public Admin./ Instit./ Hsg.	31	0	2	1	3	1	5	29
Total	**169**	**2**	1	**4**	3	**6**	4	**162**
EDUCATION								
Public Education	287	1	0	10	3	10	4	276
Higher Education	282	-	-	-	-	-	-	282
Total	**568**	**1**	0	**10**	2	**10**	2	**558**
HEALTH								
Public Health Care	53	-	-	-	-	-	-	53
Water Supply	147	1	1	11	8	13	9	134
Waste Water Disposal	206	1	1	10	5	12	6	194
Solid Waste Management	47	-	-	-	-	-	-	47
Total	**453**	**3**	1	**22**	5	**24**	5	**429**
RECREATION AND CULTURE								
Recreational Facilities	28	-	-	-	-	-	-	28
Arts / Library	19	-	-	-	-	-	-	19
Historic Resources	15	-	-	-	-	-	-	15
Total	**62**	-	-	-	-	-	-	**62**
ENVIRONMENT								
Storm Water Management	40	1	3	2	6	3	8	36
Shore and River Protection	10	-	-	-	-	-	-	10
Sensitive Land and Water	10	1	7	1	6	1	14	8
Open Space	10	0	1	0	2	0	3	10
Air Pollution	2	-	-	-	-	-	-	2
Total	**71**	**2**	3	**3**	4	**5**	7	**66**
OVERALL TOTAL	**2,889**	**100**	3	**70**	2	**170**	6	**2,719**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2D
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
WACCAMAW REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	1,705	156	9	52	3	208	12	1,497
Bridges	125	20	16	0	0	21	17	104
Public Transportation	113	-	-	-	-	-	-	113
Freight (Rail and Road)	16	-	-	-	-	-	-	16
Ports	8	-	-	-	-	-	-	8
Aviation (Including Air Freight)	48	-	-	-	-	-	-	48
Other Transportation Facilities	1	0	16	0	1	0	16	1
Total	**2,015**	**177**	9	**52**	3	**229**	11	**1,786**
COMMERCE								
Economic Development	117	0	0	0	0	0	0	117
Farmland Retention	4	0	3	0	1	0	4	4
Energy	19	-	-	-	-	-	-	19
Telecommunications	51	-	-	-	-	-	-	51
Total	**191**	**0**	0	**0**	0	**0**	0	**191**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	84	1	1	2	3	3	4	80
Justice (Courts)	22	0	1	0	2	1	2	22
Public Admin./ Instit./ Hsg.	33	0	1	1	4	2	5	31
Total	**139**	**2**	1	**4**	3	**5**	4	**134**
EDUCATION								
Public Education	592	2	0	12	2	14	2	578
Higher Education	71	-	-	-	-	-	-	71
Total	**663**	**2**	0	**12**	2	**14**	2	**649**
HEALTH								
Public Health Care	54	-	-	-	-	-	-	54
Water Supply	150	1	0	14	9	14	9	136
Waste Water Disposal	185	4	2	12	7	16	9	168
Solid Waste Management	39	-	-	-	-	-	-	39
Total	**428**	**4**	1	**26**	6	**31**	7	**397**
RECREATION AND CULTURE								
Recreational Facilities	35	-	-	-	-	-	-	35
Arts / Library	22	-	-	-	-	-	-	22
Historic Resources	26	-	-	-	-	-	-	26
Total	**82**	-	-	-	-	-	-	**82**
ENVIRONMENT								
Storm Water Management	51	2	4	3	6	5	9	47
Shore and River Protection	86	-	-	-	-	-	-	86
Sensitive Land and Water	27	2	9	3	11	5	19	22
Open Space	13	0	2	1	4	1	6	12
Air Pollution	3	-	-	-	-	-	-	3
Total	**180**	**4**	2	**6**	4	**11**	6	**169**
OVERALL TOTAL	**3,698**	**189**	5	**101**	3	**290**	8	**3,408**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2E
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
LOWCOUNTRY REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	891	63	7	27	3	91	10	801
Bridges	145	22	15	-	-	22	15	123
Public Transportation	50	-	-	-	-	-	-	50
Freight (Rail and Road)	9	-	-	-	-	-	-	9
Ports	125	-	-	-	-	-	-	125
Aviation (Including Air Freight)	271	-	-	-	-	-	-	271
Other Transportation Facilities	1	0	15	0	1	0	16	0
Total	**1,491**	**86**	6	**27**	2	**113**	8	**1,379**
COMMERCE								
Economic Development	100	0	0	0	0	0	0	100
Farmland Retention	5	0	4	0	2	0	6	5
Energy	11	-	-	-	-	-	-	11
Telecommunications	33	-	-	-	-	-	-	33
Total	**150**	**0**	0	**0**	0	**0**	0	**149**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	48	1	1	1	2	2	3	47
Justice (Courts)	20	0	1	0	3	1	3	19
Public Admin./ Instit./ Hsg.	24	0	1	1	4	1	5	23
Total	**92**	**1**	1	**2**	3	**3**	4	**89**
EDUCATION								
Public Education	331	1	0	7	2	8	2	323
Higher Education	63	-	-	-	-	-	-	63
Total	**394**	**1**	0	**7**	2	**8**	2	**386**
HEALTH								
Public Health Care	56	-	-	-	-	-	-	56
Water Supply	100	0	0	9	9	9	10	90
Waste Water Disposal	194	9	5	8	4	17	9	177
Solid Waste Management	35	-	-	-	-	-	-	35
Total	**384**	**10**	3	**17**	4	**26**	7	**357**
RECREATION AND CULTURE								
Recreational Facilities	61	-	-	-	-	-	-	61
Arts / Library	10	-	-	-	-	-	-	10
Historic Resources	13	-	-	-	-	-	-	13
Total	**84**	**-**	-	**-**	-	**-**	-	**84**
ENVIRONMENT								
Storm Water Management	31	1	3	2	6	3	9	28
Shore and River Protection	95	-	-	-	-	-	-	95
Sensitive Land and Water	42	4	9	5	12	9	20	33
Open Space	7	0	1	0	3	0	4	6
Air Pollution	2	-	-	-	-	-	-	2
Total	**176**	**5**	3	**7**	4	**12**	7	**165**
OVERALL TOTAL	**2,771**	**103**	4	**60**	2	**163**	6	**2,608**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2F
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
LOWER SAVANNAH REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	1,219	67	6	27	2	94	8	1,125
Bridges	115	17	15	0	0	17	15	98
Public Transportation	46	-	-	-	-	-	-	46
Freight (Rail and Road)	19	-	-	-	-	-	-	19
Ports	-	-		-		-		-
Aviation (Including Air Freight)	10	-	-	-	-	-	-	10
Other Transportation Facilities	1	0	16	0	1	0	17	1
Total	**1,410**	**84**	6	**27**	2	**111**	8	**1,299**
COMMERCE								
Economic Development	53	0	0	0	0	0	0	53
Farmland Retention	4	0	2	0	1	0	2	4
Energy	42	-	-	-	-	-	-	42
Telecommunications	48	-	-	-	-	-	-	48
Total	**147**	**0**	0	**0**	0	**0**	0	**146**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	117	2	1	3	3	5	4	112
Justice (Courts)	37	0	1	1	2	1	3	36
Public Admin./ Instit./ Hsg.	25	0	1	1	2	1	3	25
Total	**179**	**2**	1	**5**	3	**7**	4	**172**
EDUCATION								
Public Education	367	1	0	7	2	8	2	359
Higher Education	251	-	-	-	-	-	-	251
Total	**619**	**1**	0	**7**	1	**8**	1	**611**
HEALTH								
Public Health Care	65	-	-	-	-	-	-	65
Water Supply	121	0	0	9	7	9	7	112
Waste Water Disposal	151	2	1	8	5	10	7	141
Solid Waste Management	57	-	-	-	-	-	-	57
Total	**394**	**2**	1	**17**	4	**19**	5	**375**
RECREATION AND CULTURE								
Recreational Facilities	39	-	-	-	-	-	-	39
Arts / Library	17	-	-	-	-	-	-	17
Historic Resources	20	-	-	-	-	-	-	20
Total	**76**	-	-	-	-	-	-	**76**
ENVIRONMENT								
Storm Water Management	46	1	3	2	4	3	7	43
Shore and River Protection	9	-	-	-	-	-	-	9
Sensitive Land and Water	7	0	5	0	5	1	9	6
Open Space	10	0	1	0	2	0	3	10
Air Pollution	4	-	-	-	-	-	-	4
Total	**76**	**2**	2	**2**	3	**4**	5	**72**
OVERALL TOTAL	**2,901**	**91**	3	**58**	2	**149**	5	**2,752**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2G
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
CENTRAL MIDLANDS REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	2,395	170	7	70	3	240	10	2,154
Bridges	128	16	13	1	1	17	13	111
Public Transportation	182	-	-	-	-	-	-	182
Freight (Rail and Road)	49	-	-	-	-	-	-	49
Ports	-	-		-		-		-
Aviation (Including Air Freight)	42	-	-	-	-	-	-	42
Other Transportation Facilities	3	0	7	0	2	0	10	2
Total	**2,798**	**186**	7	**71**	3	**257**	9	**2,541**
COMMERCE								
Economic Development	106	0	0	0	0	0	0	106
Farmland Retention	8	0	2	0	1	0	2	8
Energy	51	-	-	-	-	-	-	51
Telecommunications	232	-	-	-	-	-	-	232
Total	**397**	**0**	0	**0**	0	**0**	0	**397**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	121	1	1	3	2	4	3	116
Justice (Courts)	66	1	1	1	2	2	3	65
Public Admin./ Instit./ Hsg.	85	2	2	2	3	4	5	81
Total	**272**	**4**	1	**6**	2	**10**	4	**262**
EDUCATION								
Public Education	786	2	0	16	2	18	2	768
Higher Education	923	-	-	-	-	-	-	923
Total	**1,709**	**2**	0	**16**	1	**18**	1	**1,691**
HEALTH								
Public Health Care	143	-	-	-	-	-	-	143
Water Supply	313	0	0	22	7	22	7	290
Waste Water Disposal	320	2	1	20	6	22	7	298
Solid Waste Management	104	-	-	-	-	-	-	104
Total	**880**	**2**	0	**42**	5	**45**	5	**836**
RECREATION AND CULTURE								
Recreational Facilities	59	-	-	-	-	-	-	59
Arts / Library	84	-	-	-	-	-	-	84
Historic Resources	44	-	-	-	-	-	-	44
Total	**187**	**-**	-	**-**	-	**-**	-	**187**
ENVIRONMENT								
Storm Water Management	96	3	3	5	5	8	8	88
Shore and River Protection	11	-	-	-	-	-	-	11
Sensitive Land and Water	20	2	8	1	4	2	12	18
Open Space	25	0	1	0	1	1	2	24
Air Pollution	5	-	-	-	-	-	-	5
Total	**158**	**5**	3	**6**	4	**11**	7	**147**
OVERALL TOTAL	**6,401**	**200**	3	**141**	2	**341**	5	**6,060**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2H
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
SANTEE LYNCHES REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	744	53	7	17	2	69	9	675
Bridges	86	14	16	0	0	14	16	72
Public Transportation	35	-	-	-	-	-	-	35
Freight (Rail and Road)	10	-	-	-	-	-	-	10
Ports	-	-		-		-		-
Aviation (Including Air Freight)	7	-	-	-	-	-	-	7
Other Transportation Facilities	0	0	13	0	1	0	14	0
Total	**883**	**67**	8	**17**	2	**83**	9	**799**
COMMERCE								
Economic Development	59	0	0	0	0	0	0	59
Farmland Retention	3	0	1	0	0	0	2	3
Energy	16	-	-	-	-	-	-	16
Telecommunications	24	-	-	-	-	-	-	24
Total	**102**	**0**	0	**0**	0	**0**	0	**102**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	60	1	1	1	2	2	4	58
Justice (Courts)	24	0	1	1	3	1	4	23
Public Admin./ Instit./ Hsg.	11	0	1	0	2	0	2	11
Total	**95**	**1**	1	**2**	2	**3**	3	**92**
EDUCATION								
Public Education	201	0	0	4	2	4	2	197
Higher Education	47	-	-	-	-	-	-	47
Total	**248**	**0**	0	**4**	2	**4**	2	**244**
HEALTH								
Public Health Care	29	-	-	-	-	-	-	29
Water Supply	80	0	0	5	7	5	7	74
Waste Water Disposal	113	3	3	5	4	8	7	105
Solid Waste Management	39	-	-	-	-	-	-	39
Total	**260**	**3**	1	**10**	4	**13**	5	**247**
RECREATION AND CULTURE								
Recreational Facilities	14	-	-	-	-	-	-	14
Arts / Library	20	-	-	-	-	-	-	20
Historic Resources	13	-	-	-	-	-	-	13
Total	**47**	-	-	-	-	-	-	**47**
ENVIRONMENT								
Storm Water Management	23	1	3	1	5	2	8	21
Shore and River Protection	8	-	-	-	-	-	-	8
Sensitive Land and Water	8	0	4	1	8	1	13	7
Open Space	8	0	1	0	2	0	3	8
Air Pollution	2	-	-	-	-	-	-	2
Total	**49**	**1**	2	**2**	4	**3**	6	**46**
OVERALL TOTAL	**1,684**	**72**	4	**35**	2	**107**	6	**1,577**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2I
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
APPALACHIAN REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	3,710	204	5	124	3	327	9	3,383
Bridges	348	43	12	5	1	48	14	300
Public Transportation	255	-	-	-	-	-	-	255
Freight (Rail and Road)	65	-	-	-	-	-	-	65
Ports	-	-		-		-		-
Aviation (Including Air Freight)	123	-	-	-	-	-	-	123
Other Transportation Facilities	4	0	6	0	2	0	8	4
Total	**4,505**	**247**	5	**129**	3	**376**	8	**4,130**
COMMERCE								
Economic Development	403	1	0	0	0	1	0	402
Farmland Retention	14	0	2	0	1	0	2	14
Energy	68	-	-	-	-	-	-	68
Telecommunications	284	-	-	-	-	-	-	284
Total	**769**	**1**	0	**0**	0	**1**	0	**768**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	179	2	1	3	2	5	3	174
Justice (Courts)	44	0	0	0	1	0	1	44
Public Admin./ Instit./ Hsg.	42	0	1	1	2	1	3	41
Total	**266**	**2**	1	**5**	2	**7**	2	**259**
EDUCATION								
Public Education	1,371	2	0	26	2	28	2	1,343
Higher Education	419	-	-	-	-	-	-	419
Total	**1,790**	**2**	0	**26**	1	**28**	2	**1,762**
HEALTH								
Public Health Care	198	-	-	-	-	-	-	198
Water Supply	413	1	0	33	8	34	8	379
Waste Water Disposal	470	11	2	28	6	39	8	432
Solid Waste Management	193	-	-	-	-	-	-	193
Total	**1,275**	**12**	1	**61**	5	**73**	6	**1,202**
RECREATION AND CULTURE								
Recreational Facilities	46	-	-	-	-	-	-	46
Arts / Library	82	-	-	-	-	-	-	82
Historic Resources	72	-	-	-	-	-	-	72
Total	**200**	-	-	-	-	-	-	**200**
ENVIRONMENT								
Storm Water Management	139	4	3	7	5	11	8	128
Shore and River Protection	16	-	-	-	-	-	-	16
Sensitive Land and Water	42	3	8	3	7	6	15	36
Open Space	48	1	1	2	3	2	5	45
Air Pollution	10	-	-	-	-	-	-	10
Total	**255**	**8**	3	**11**	4	**19**	7	**236**
OVERALL TOTAL	**9,059**	**271**	3	**232**	3	**503**	6	**8,556**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996

Figure 2J
SOUTH CAROLINA COST OF SPRAWL SAVINGS (1995-2015) BY SOURCE
(in millions of current dollars)
BERKELEY-CHARLESTON-DORCHESTER REGION

Service Area	*Costs after Initial Savings*	*Savings from*						*Final*
		Regional		*Local*		*Savings*		
		$	*%*	*$*	*%*	*$*	*%*	
TRANSPORTATION								
Roads	3,039	295	10	84	3	379	12	2,661
Bridges	1,046	185	18	0	0	186	18	861
Public Transportation	176	-	-	-	-	-	-	176
Freight (Rail and Road)	43	-	-	-	-	-	-	43
Ports	1,219	-	-	-	-	-	-	1,219
Aviation (Including Air Freight)	32	-	-	-	-	-	-	32
Other Transportation Facilities	5	1	10	0	2	1	12	4
Total	**5,561**	**481**	9	**84**	2	**565**	10	**4,996**
COMMERCE								
Economic Development	143	0	0	0	0	0	0	143
Farmland Retention	8	0	2	0	1	0	2	7
Energy	47	-	-	-	-	-	-	47
Telecommunications	263	-	-	-	-	-	-	263
Total	**460**	**0**	0	**0**	0	**0**	0	**460**
PUBLIC SAFETY, ADMINISTRATION AND WELFARE								
Public Safety (Jails)	115	1	1	1	1	2	2	113
Justice (Courts)	86	1	1	1	1	2	2	84
Public Admin./ Instit./ Hsg.	98	1	1	2	2	3	3	95
Total	**298**	**2**	1	**5**	2	**7**	2	**292**
EDUCATION								
Public Education	718	2	0	14	2	15	2	702
Higher Education	315	-	-	-	-	-	-	315
Total	**1,032**	**2**	0	**14**	1	**15**	1	**1,017**
HEALTH								
Public Health Care	239	-	-	-	-	-	-	239
Water Supply	249	1	0	22	9	23	9	227
Waste Water Disposal	306	11	4	17	6	28	9	278
Solid Waste Management	95	-	-	-	-	-	-	95
Total	**889**	**12**	1	**39**	4	**51**	6	**838**
RECREATION AND CULTURE								
Recreational Facilities	97	-	-	-	-	-	-	97
Arts / Library	63	-	-	-	-	-	-	63
Historic Resources	82	-	-	-	-	-	-	82
Total	**242**	-	-	-	-	-	-	**242**
ENVIRONMENT								
Storm Water Management	85	2	2	5	6	7	8	78
Shore and River Protection	81	-	-	-	-	-	-	81
Sensitive Land and Water	26	2	8	2	6	4	14	23
Open Space	25	0	1	1	2	1	3	25
Air Pollution	6	-	-	-	-	-	-	6
Total	**223**	**4**	2	**7**	3	**11**	5	**212**
OVERALL TOTAL	**8,706**	**502**	6	**148**	2	**649**	7	**8,056**

Note: The percentages in this table are not identical to those listed in figure 1 because the percentages in figure 1 are applied only to the new growth component of costs.

Source: Rutgers CUPR, Wilbur Smith Associates, Siemon, Larsen & Marsh, Sandstone Environmental Associates - Projections, December 1996